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Signature

Applicant : Karl-Willie Hoel
Application No. : 10/089,751
Filed : April 1, 2002
Title : SUBSEA LUBRICATOR DEVICE AND METHODS OF
CIRCULATING FLUIDS IN A SUBSEA LUBRICATOR

Docket No. : 48046/DBP/T164

SUPPLEMENTAL PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Post Office Box 7068
Pasadena, CA 91109-7068
Date: Feb 24, 2003

Commissioner:

Please amend the above-identified application as follows:

IN THE CLAIMS

By this Amendment, Applicant is cancelling claims 1-26 and adding new claims 27-54.
Pending claims 27 to 54 to follow.

27. (New) A subsea lubricator for attachment to a subsea Christmas tree comprising at least one tree passage therethrough, said subsea lubricator comprising:

at least one lubricator passage which communicates with at least one tree passage in said subsea Christmas tree; and

at least one bypass assembly comprising at least one bypass passage which communicates with at least one tree passage in said subsea Christmas tree.

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28. (New) The subsea lubricator of claim 27, wherein said at least one bypass assembly further comprises at least one lower bypass pipe and at least one upper bypass pipe removably connected to said at least one lower bypass pipe.

29. (New) The subsea lubricator of claim 28, wherein said at least one bypass assembly comprises at least two upper bypass pipes.

30. (New) The subsea lubricator of claim 28, further comprising a tool housing portion comprising an upper end and a bore which defines a portion of said at least one lubricator passage, said bypass assembly further comprising a crossover assembly for fluidly connecting said at least one upper bypass pipe with said at least one lubricator passage at a location proximate to said upper end of said tool housing portion.

31. (New) The subsea lubricator of claim 30, further comprising a pressure control assembly disposed generally below said tool housing portion, said pressure control assembly comprising a lower end, a bore which defines a portion of said at least one lubricator passage, and at least one pressure control valve for selectively closing said at least one lubricator passage, said bypass assembly further comprising a valve assembly for fluidly connecting said at least one lower bypass pipe with said at least one lubricator passage at a location below said at least one pressure control valve.

32. (New) The subsea lubricator of claim 30, wherein said crossover assembly further comprises a connector for fluidly connecting said crossover assembly to an external fluid source.

33. (New) The subsea lubricator of claim 31, wherein said subsea Christmas tree further comprises a production passage and an annulus passage, said valve assembly further comprising a first inlet fluidly connected to said at least one lower bypass pipe, a second inlet fluidly connected to a subsea umbilical, a first outlet fluidly connected to said production passage in said subsea Christmas tree, and a second outlet fluidly connected to said annulus passage in said subsea Christmas tree.

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34. (New) The subsea lubricator of claim 33, wherein said valve assembly further comprises at least one check valve disposed in each of said first and second inlets.

35. (New) The subsea lubricator of claim 33, wherein said valve assembly further comprises at least one stop valve disposed in said first outlet.

36. (New) The subsea lubricator of claim 33, wherein said valve assembly further comprises at least one stop valve disposed in said second outlet.

37. (New) The subsea lubricator of claim 31, further comprising an adaptor, said valve assembly forming a portion of said adaptor.

38. (New) The subsea lubricator of claim 37, wherein said adaptor is removably attached to said pressure control assembly, said adaptor comprising a subsea connector adapted for connection to said subsea Christmas tree.

39. (New) The subsea lubricator of claim 37, wherein said subsea Christmas tree further comprises a production passage and an annulus passage, said adaptor further comprising a first adaptor passage for fluidly connecting said at least one lubricator passage with said production passage in said subsea Christmas tree, and a second adaptor passage for fluidly connecting said at least one lower bypass pipe with said annulus passage in said subsea Christmas tree.

40. (New) The subsea lubricator of claim 37, wherein said subsea Christmas tree further comprises a production passage and an annulus passage, said adaptor further comprising a first adaptor passage for fluidly connecting said at least one lubricator passage with said annulus passage in said subsea Christmas tree, with a second adaptor passage for fluidly connecting said at least one lower bypass pipe with said production passage in said subsea Christmas tree.

41. (New) The subsea lubricator of claim 37, wherein said lubricator further comprises a valve actuator.

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42. (New) A method for circulating fluid in a subsea lubricator attached to a subsea Christmas tree landed on a subsea well, said method comprising:

providing at least one bypass passage fluidly connecting said subsea lubricator to said subsea Christmas tree;

connecting said subsea lubricator to a source of a first external fluid;

injecting said first external fluid into said subsea lubricator to displace a first internal fluid within said subsea lubricator; and

circulating said first internal fluid to said subsea well through said bypass passage and said subsea Christmas tree or into an external flow line.

43. (New) The method of claim 42, wherein said first external fluid comprises water.

44. (New) The method of claim 42, wherein said first external fluid comprises a hydrate inhibiting fluid.

45. (New) The method of claim 44, wherein said hydrate inhibitor is selected from the group consisting of methanol and glycol.

46. (New) The method of claim 42, wherein said first external fluid is a diluent fluid.

47. (New) The method of claim 42, wherein said first internal fluid comprises water, said method further comprising injecting a hydrate inhibiting fluid into said subsea well concurrently with circulating said first internal fluid.

48. (New) The method of claim 42, wherein said first internal fluid comprises hydrocarbons and said first external fluid comprises a mixture of water and a hydrate inhibiting fluid, said method further comprising:

connecting said subsea lubricator to a source of a second external fluid after circulating said first internal fluid, said second external fluid comprising water;

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injecting said second external fluid into said subsea lubricator to displace a second internal fluid, said second internal fluid comprising the mixture of water and hydrate inhibiting fluid, the hydrate inhibiting fluid comprising said first external fluid;

circulating said second internal fluid to said subsea well through said bypass passage and said subsea Christmas tree; and

injecting a hydrate inhibiting fluid into said subsea well concurrently with circulating said second internal fluid.

49. (New) A method for killing a subsea well having a subsea Christmas tree landed thereon, said method comprising:

landing a subsea device on said subsea Christmas tree, said subsea device comprising at least one valve;

providing at least one bypass passage fluidly connecting said subsea Christmas tree with a source of kill fluid; and

when said at least one valve is closed, injecting said kill fluid into said well through said bypass passage and said subsea Christmas tree.

50. (New) A method of circulating fluids in a subsea well having a subsea Christmas tree landed thereon, said method comprising:

providing a production passage and an annulus passage in said subsea Christmas tree;

providing a tubing string below said subsea Christmas tree in fluid communication with said production passage;

providing a tubing annulus below said subsea Christmas tree in fluid in communication with said annulus passage;

providing a downhole fluid connection between said tubing string and said tubing annulus;

providing a pressure control assembly having a first passage therethrough and a lower bypass pipe;

landing said pressure control assembly on said subsea Christmas tree such that said first passage is fluidly connected to said production passage and said lower bypass pipe is fluidly connected to said annulus passage;

landing a tool housing portion on said pressure control assembly;

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removing said tool housing portion from said pressure control assembly;
connecting a first supply pipe to said first passage;
connecting a second supply pipe to said lower bypass passage; and
circulating fluid from said second supply pipe, through said lower bypass pipe, through said annulus passage, down into the well through said tubing annulus, through said downhole fluid connection, up through said tubing string, through said production passage, through said first passage in said pressure control assembly, and into said first supply pipe.

51. (New) A method for circulating fluids in a subsea well having a subsea Christmas tree landed thereon, said method comprising the steps of:

providing a production passage and an annulus passage in said subsea Christmas tree;
providing a tubing string below said subsea Christmas tree in fluid communication with said production passage;

providing a tubing annulus below said subsea Christmas tree in fluid communication with said annulus passage;

providing a downhole fluid connection between said tubing string and said tubing annulus;
providing a pressure control assembly having a first passage therethrough and a lower bypass pipe;

landing said pressure control assembly on said subsea Christmas tree such that said first passage is fluidly connected to said production passage and said lower bypass pipe is fluidly connected to said annulus passage;

connecting a first supply pipe to said first passage;

connecting a second supply pipe to said lower bypass pipe; and

circulating fluid from said first supply pipe, through said first passage in said pressure control assembly, through said production passage, down into the well through said tubing string, through said downhole fluid connection, up through said tubing annulus, through said annulus passage, through said lower bypass pipe, and into said second supply pipe.

52. (New) A subsea lubricator for attachment to a subsea Christmas tree comprising at least one tree passage therethrough, said subsea lubricator comprising:

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at least one lubricator passage which communicates with at least one tree passage in said subsea Christmas tree;

at least one bypass assembly comprising at least one bypass passage which communicates with at least one tree passage in said subsea Christmas tree, the at least one bypass comprising at least one lower and at least one upper bypass pipe removably connected to each other;

a tool housing portion comprising an upper end and a bore which defines a portion of said at least one lubricator passage; and

a fluid connection between the at least one upper bypass pipe and the lubricator passage at an upper end of the tool housing, the fluid connection comprising a crossover having a connector for attachment of an external fluid supply source.

53. (New) A subsea lubricator for attachment to a subsea Christmas tree comprising at least one tree passage therethrough, said subsea lubricator comprising:

at least one lubricator passage which communicates with at least one tree passage in said subsea Christmas tree;

at least one bypass assembly comprising at least one bypass passage which communicates with at least one tree passage in said subsea Christmas tree, the at least one bypass comprising at least one lower and at least one upper bypass pipe removably connected to each other;

a tool housing portion comprising an upper end and a bore which defines a portion of said at least one lubricator passage;

a fluid connection between the at least one upper bypass pipe and the lubricator passage at an upper end of the tool housing;

a pressure control assembly coupled between the tool housing portion and said subsea Christmas tree; and

a valve assembly providing fluid connection between the at least one lower bypass pipe and a passage of the pressure control assembly at a position below at least one valve of the pressure control assembly, the valve assembly comprising a first inlet connected to at least one lower bypass pipe, a second inlet connected to an umbilical, a first outlet connected to a production passage of the Christmas tree, and a second outlet connected to an annulus passage of the Christmas tree.

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54. (New) A subsea lubricator for attachment to a subsea Christmas tree comprising at least one tree passage therethrough, said subsea lubricator comprising:

at least one lubricator passage which communicates with at least one tree passage in said subsea Christmas tree;

at least one bypass assembly comprising at least one bypass passage which communicates with at least one tree passage in said subsea Christmas tree, the at least one bypass comprising at least one lower and at least one upper bypass pipe removably connected to each other;

a tool housing portion comprising an upper end and a bore which defines a portion of said at least one lubricator passage;

a fluid connection between the at least one upper bypass pipe and the lubricator passage at an upper end of the tool housing;

a pressure control assembly coupled between the tool housing portion and said subsea Christmas tree;

a valve assembly providing fluid connection between the at least one lower bypass pipe and a passage of the pressure control assembly at a position below at least one valve of the pressure control assembly, the valve assembly comprising a first inlet connected to at least one lower bypass pipe, a second inlet connected to an umbilical, a first outlet connected to a production passage of the Christmas tree, and a second outlet connected to an annulus passage of the Christmas tree; and

an adapter removably attachable to the pressure control assembly comprising a connector device which is adapted to connector profiles for various Christmas trees.